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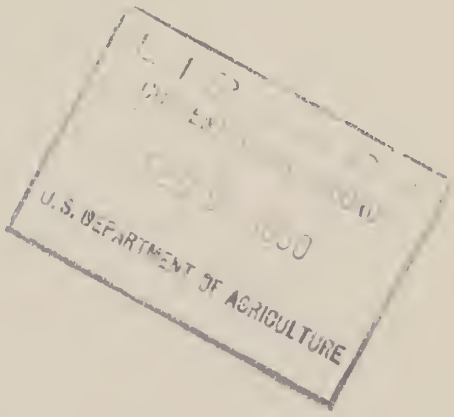

RICE CURLS

A New Food Product from Rice

By R. L. Roberts, E. B. Kester, and D. F. Houston
Western Regional Research Laboratory
Albany, California

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Rice Curls -- good with cold drinks.

RICE CURLS -- A New Food Product from Rice

By R. L. Roberts, E. B. Kester, and D. F. Houston,
Western Regional Research Laboratory, Albany, California.

RICE CURLS are a new snack food, comparable to potato chips or corn chips. They can be made inexpensively from broken rice, have excellent flavor, and store and handle well. The process for manufacturing them is simple: Ground rice is mixed with hot water to form a paste, which is extruded with suitable equipment. The resulting "curls" are cut to desired lengths and fried in vegetable oil. They make an attractive food specialty suitable for commercial production.

A report of work done under the Research and Marketing Act of 1946. The authors are staff members of the Vegetable Processing Division, Western Regional Research Laboratory, one of four Regional Laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, United States Department of Agriculture.

RICE CURLS

PRODUCT AND PROCESS

Rice Curls can be used like potato chips and corn chips as a snack food or appetizer. They are especially good with salads and beverages. Because of their pleasing flavor, texture, and appearance, and their satisfactory handling and keeping qualities, they are well suited for commercial manufacture. They can be made from broken grains of rice and therefore offer a possible outlet for fractions of milled rice that usually sell at lower prices than unbroken or head rice.

To make Rice Curls, ground rice is stirred into hot water to form a stiff paste. The paste is extruded through a circular orifice, cut to desired lengths, fried in hot vegetable oil, drained, and sprinkled with salt and monosodium glutamate or other flavorings. The resulting crisp, golden-brown curls make a tasty and attractive food specialty.

This report describes in detail the results of work at the Western Regional Research Laboratory to develop Rice Curls as a possible commercial product. Suggestions are offered for preparing several types of Rice Curls.

Equipment used in laboratory development of Rice Curls includes small hand-operated extruder (right) and electric deep-fat fryer. The "curls" are cut to 3-inch lengths as they come out of the extruder and drop into the hot cooking oil.

PREPARATION AND COOKING

One aim of this research was to produce Rice Curls with as low residual-oil content as possible consistent with good appearance, texture, and flavor of the product. Generally speaking, the lower the oil content, the less greasy this type of product will feel and the better it will keep.

It is recognized that the residual-oil content of other foods cooked in deep fat can be reduced by lowering the moisture content and increasing the cooking temperature. Accordingly, rice pastes were prepared for cooking tests from two different screen sizes of ground rice mixed in various rice-to-water ratios, and the extruded curls were cooked at temperatures of 390° and 425° F.

The rice used was chiefly California Pearl white rice with a moisture content of about 15 percent. It was ground in a coffee mill to pass either a 24-mesh screen (fine grind) or a 16-mesh screen (coarse grind).

Small batches of rice mix were prepared by adding 50, 75, or 100 cc. of ground rice to 100 cc. of boiling water. The mixes were stirred vigorously for about a minute to blend them thoroughly and then allowed to cool. The resulting pastes were extruded through a circular orifice 3/16 inch in diameter, cut to about 3-inch lengths, and dropped into cooking oil.

The curls were cooked until bubbling stopped, showing that all water had been removed, and were then drained and cooled on absorbent paper.

Results of a representative series of cooking tests are summarized in the following table:

EFFECT OF VARIATIONS IN RICE MIX AND COOKING CONDITIONS ON OIL CONTENT OF RICE CURLS

GRIND	GRAMS RICE PER 100 cc. WATER	OIL TEMPERATURE	APPROXIMATE COOKING TIME	OIL CONTENT OF FINAL PRODUCT*
		°F.	*Minutes*	*Percent*
Coarse	50	390	2-3/4	37
Coarse	50	425	2-1/2	39
Coarse	75	390	2-3/4	26
Coarse	75	425	2-1/2	27
Fine	75	390	3-1/4	25
Fine	75	425	3	23
Coarse	100	390	2-3/4	20
Coarse	100	425	2-1/4	18

* Oil content was calculated from weight loss obtained by Soxhlet extraction with hexane.

When cooked, drained, and salted, the crisp, golden-brown Rice Curls are ready for packaging.

EFFECTS OF VARIATION IN PROCEDURE

As the table shows, oil content of the final product decreased as the proportion of rice in the mix increased. Cooking times required were independent of the rice-to-water ratios of the mixes. Cooking was completed somewhat more quickly at the higher temperature, as expected, and the product made with finely ground rice took slightly longer to cook than that made with coarsely ground rice.

The curls made from finely ground rice had a smoother, more tender texture, as well as lower oil content, than the product from coarsely ground rice prepared and cooked under similar conditions. The finer grind also gave a product that looked and felt less oily than that from the coarse grind, even in cases where the actual oil content of the two products was approximately equal.

Several vegetable oils were used in the tests. Rice Curls cooked in corn, cottonseed, peanut, and sesame-seed oils all had about the same physical characteristics, but those cooked in hydrogenated cottonseed oil had a less oily appearance, although their actual oil retention was about the same as that of the other products.

Preliminary mixing trials showed that pastes having rice-to-water ratios of less than 50 parts per 100 were too soft to be handled satisfactorily. The most suitable mixtures, considering both ease of handling and quality of final product, were those with rice-to-water ratios of 75 to 100 parts per 100. However, it was found that if the rice used had a high moisture content or contained appreciable amounts of chalky kernels, slightly higher rice-to-water ratios were needed to give a sufficiently firm mix.

The study showed that water used in the mix should be hot enough to gelatinize the rice starch rapidly. This required a temperature of 190° F. or higher for pastes having the most suitable rice-to-water ratios.

Extruding the curls in cylindrical form 3/16 inch in diameter proved satisfactory. The final product had a firm, even-textured outer shell and a highly porous, almost open interior. Cooking was uniform and could be completed in a reasonably short time, and the Curls retained relatively little oil. Products extruded with smaller diameters, on the other hand, were tougher and harder textured, while those with diameters larger than 3/16 inch required longer cooking time, did not cook uniformly, and retained too much oil. Pieces extruded in ribbon-like form puffed to the shape of pillows when cooked and had an excessive residual-oil content.

HANDLING AND STORAGE QUALITIES

The cylindrical curls of 3/16 inch diameter were found to have sufficient rigidity to withstand packaging and reasonable handling without excessive breakage.

Samples stored in open containers under prevailing Laboratory conditions remained satisfactorily crisp for as long as 3 weeks, even though they picked up about 6 percent moisture in the first 15 days.

Samples stored in closed jars for about 4 weeks developed no evidence of staleness or rancidity. Although all of the samples became rancid eventually, indicating the limited shelf life of the product, it is apparent that the curls keep their fresh flavor and crispness well enough to meet the demands of commercial acceptability.

MODIFIED RICE CURLS

Using brown rice instead of white resulted in Rice Curls with a slight taste of toasted bran. Curls made from processed (parboiled) rice had the characteristic flavor of this type of rice. Adding rice polish to the mix gave the curls a sweeter flavor and cookie-like texture. When rice bran was included in the white-rice mix the product had a slightly darker color and a flavor of toasted bran. Rice Curls prepared from mixes containing as much as 50 percent rice polish or 30 percent bran had no higher residual-oil content than the unmodified white-rice product, although the polish and bran originally contained appreciable oil.

CONSUMER ACCEPTANCE

Informal taste tests at the Laboratory demonstrated that the white-rice curls are likely to find favor with consumers. A number of those who tried the modified products expressed a liking for the

bran-flavored Rice Curls or for the sweeter variety made with rice polish in the mix. This acceptance by Laboratory tasters and the favorable handling and keeping qualities of the product seem to indicate that Rice Curls may well prove a worthwhile addition to the list of snack foods.

COSTS AND MARKETS

Commercial machinery for making Rice Curls consists of standard pieces of relatively simple equipment, comparable in cost to equipment for producing potato chips or corn curls. A complete installation capable of producing 300 pounds of Rice Curls per hour could be made for about $17,000. This estimate is based on current prices of suitable grinding and mixing equipment, extruder unit, cooking vat, oil-storage tank, salting and packaging machinery, all accessories, piping, water heater, and rice-storage bin, plus labor charges for the installation.

Rice Curls should compete directly with corn chips, corn curls, and potato chips, and possibly to some extent with pretzel sticks. Their market outlets would appear to be the same general ones as for competing products -- that is, groceries, lunch counters, bars, etc. Preliminary cost-accounting data compiled at the Western Regional Research Laboratory show that manufacturing costs for Rice Curls would closely approximate those for corn curls and would be less than the costs of potato-chip manufacture.

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